HUMAN FACTORS GUIDELINES FOR UAS IN THE NATIONAL AIRSPACE SYSTEM

Alan Hobbs
San Jose State University, Moffett Field, CA

R. Jay Shively
NASA Ames Research Center, Moffett Field, CA

Introduction

The National Aeronautics and Space Administration has recognized that human factors guidelines for the ground control station (GCS) will be a key requirement for safe and reliable operation of civilian UAS in the NAS. The agency is working with key stakeholders to develop recommendations for GCS human factor guidelines with a focus on UAs larger than 55 pounds operating beyond visual line-of-sight.

In contrast to regulations, guidelines are not mandatory requirements. However, by encapsulating solutions to identified problems or areas of risk, guidelines can provide assistance to system developers, users and regulatory agencies.

Human factor guidelines for the GCS may take several forms:

• Statements of tasks that the pilot is expected to perform via the interface. Example*: The operator shall be required to acknowledge all critical warnings.* (NATO, 2004).

• Pilot information requirements. Example*: The user shall be provided with an alert if communication link with the UAV is lost.* (DoD, 2012).

• General cognitive engineering principles. Example. *To the extent practicable, installed equipment must incorporate means to enable the flightcrew to manage errors resulting from flightcrew interactions with the equipment that can be reasonably expected in service.* (FAA, 2013).

• Physical properties of the interface. Example. *Where the interface is based on "pull down menus" ... controls that necessitate a prompt reaction of the UAV crew must be accessible at the first level of the pull down menu, otherwise, safety-critical controls in the UCS must have dedicated knobs or levers.* (NATO, 2009).

Developing Human Factor Guidelines

NASA is reviewing existing material on GCS human factors, supplemented with research results from the NASA UAS in the NAS program. The project involves the following broad steps

1. Identify underlying assumptions concerning the role of the human in a NAS-compliant UAS. Key assumptions are that normal operations will not be fully autonomous, and each UAS will be under the command of a pilot.

2. While remaining system-agnostic, develop a model of the pilot role in the UAS (Figure 1) and identify information requirements, fundamental tasks, and functions of the UAS pilot operating in the NAS. An example of a functional decomposition is shown in Figure 2.
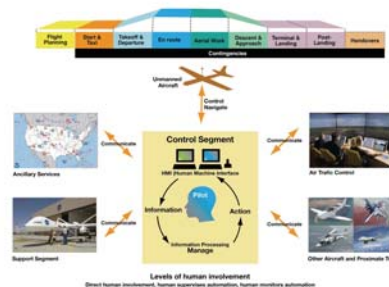

Figure 1. A model of the role of the pilot in UAS operations in the NAS.

3. On the basis of simulations, subject matter expertise and operational experience, identify critical task and functional areas where guidelines are needed.

4. Review existing Code of Federal Regulations and prior UAS human factors work (e.g. Access 5, Office of the Under Secretary of Defense, NATO STANAGs) to identify areas already adequately covered by regulatory or guidance material. Develop recommendations for guidelines in areas not adequately covered.
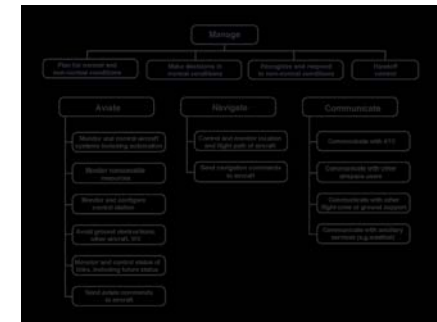

Figure 2. An illustrative description of pilot functions for UAS operations in the NAS.

Conclusion

By assuming that access to the NAS will require a human pilot to be responsible for each UAS, it is possible to broadly identify many of the tasks and functions that must be performed by the pilot. This in turn, enables the identification of areas where human factor guidelines may be of assistance. Guidelines, by their nature, are not regulations or mandatory statements, however we believe that they will be of value to all those involved in the integration of UAS into the NAS.

Contact: alan.hobbs@nasa.gov